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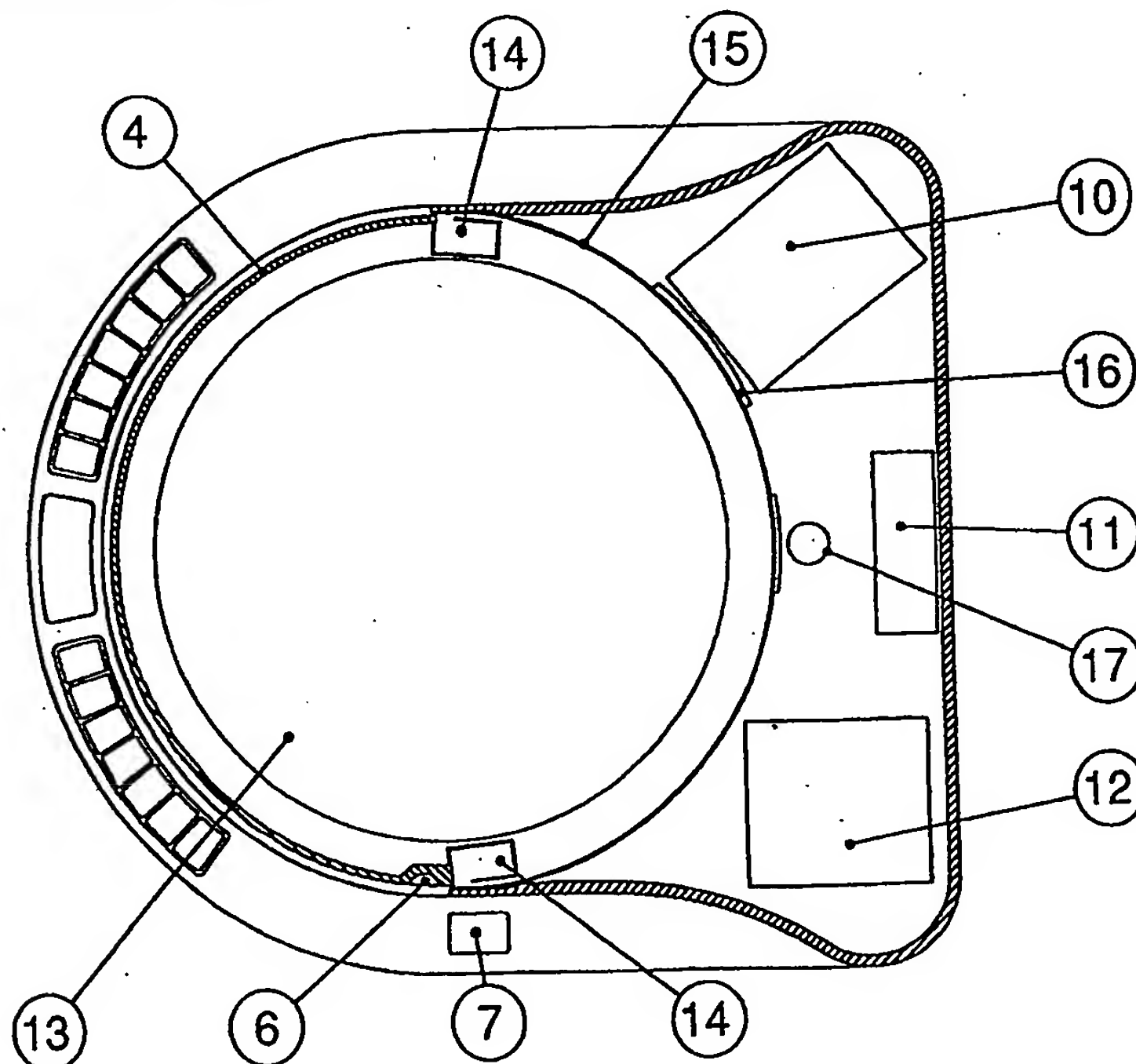
(56) Documents cited  
WO 90/03719 A1 US 4999468 A

(58) Field of search  
UK CL (Edition L) H5H HMD  
INT CL<sup>5</sup> F24C 7/02, H05B 6/76 6/80

(54) Microwave oven with a cylindrical oven cavity

(57) A microwave oven has an oven body, a cylindrical oven cavity 13 located within said body and having a central axis, a hemi-cylindrical door 4, and microwave controls mounted in the oven body. When the door is opened or closed it moves into or out of the oven body along a path substantially circumferential to the oven cavity, rotating about an axis at least substantially coincident with the axis of the oven cavity. The oven cavity is such that the angle subtended by horizontal radii drawn from the axis of the oven cavity to the sides of the aperture formed when the door is fully open is greater than 110°. Seals 14 co-operate with the oven liner 15.

Fig 4



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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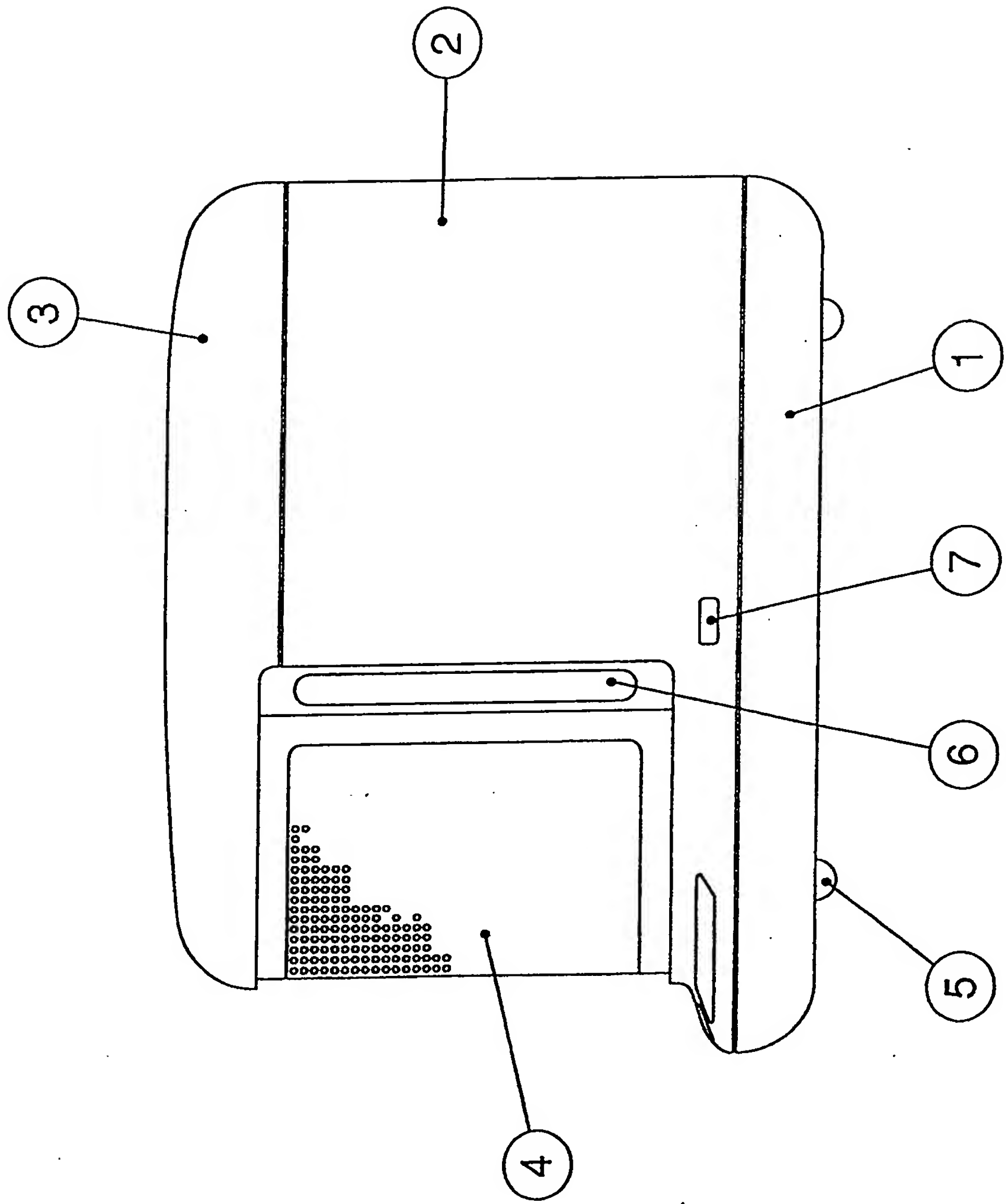


Fig 1

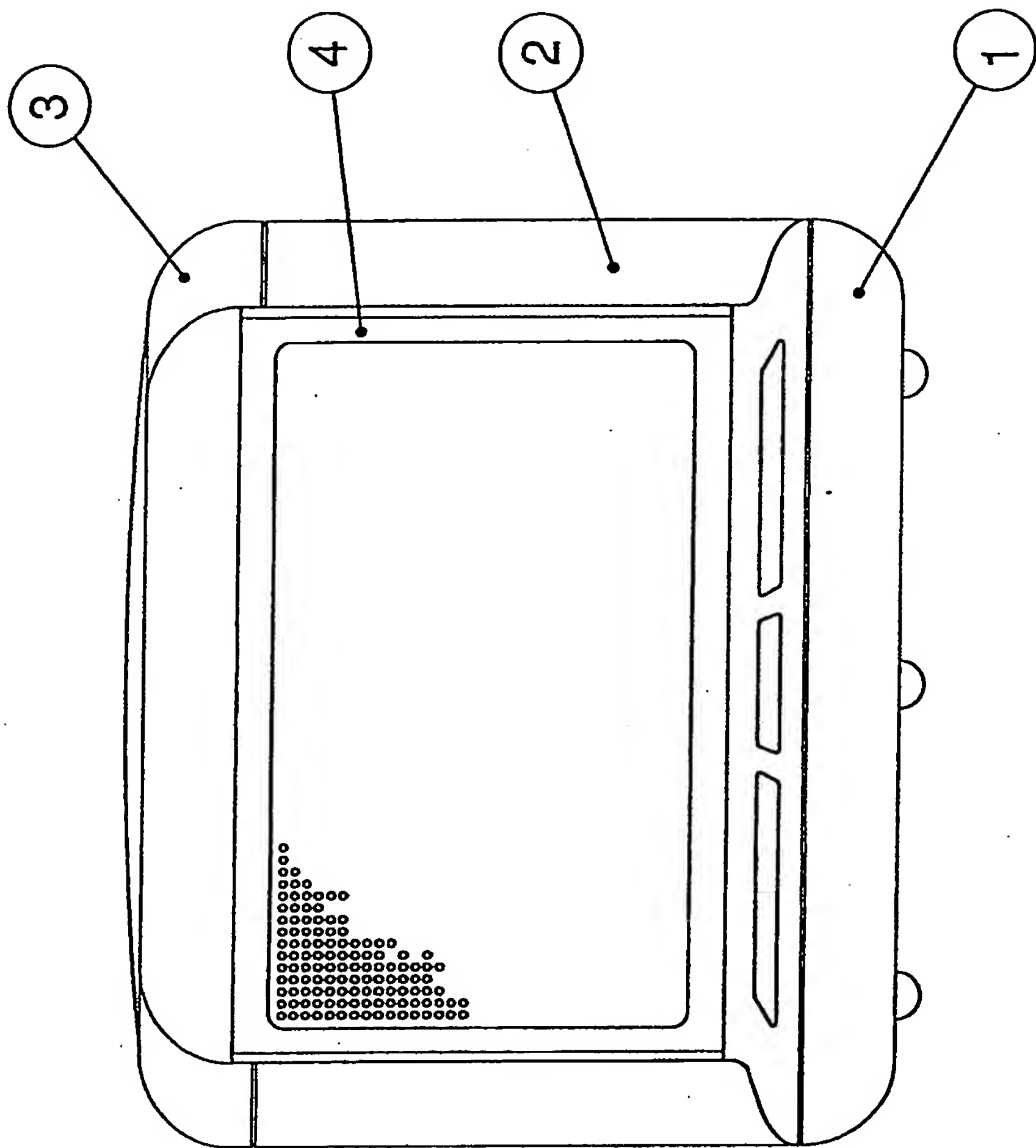


Fig 2

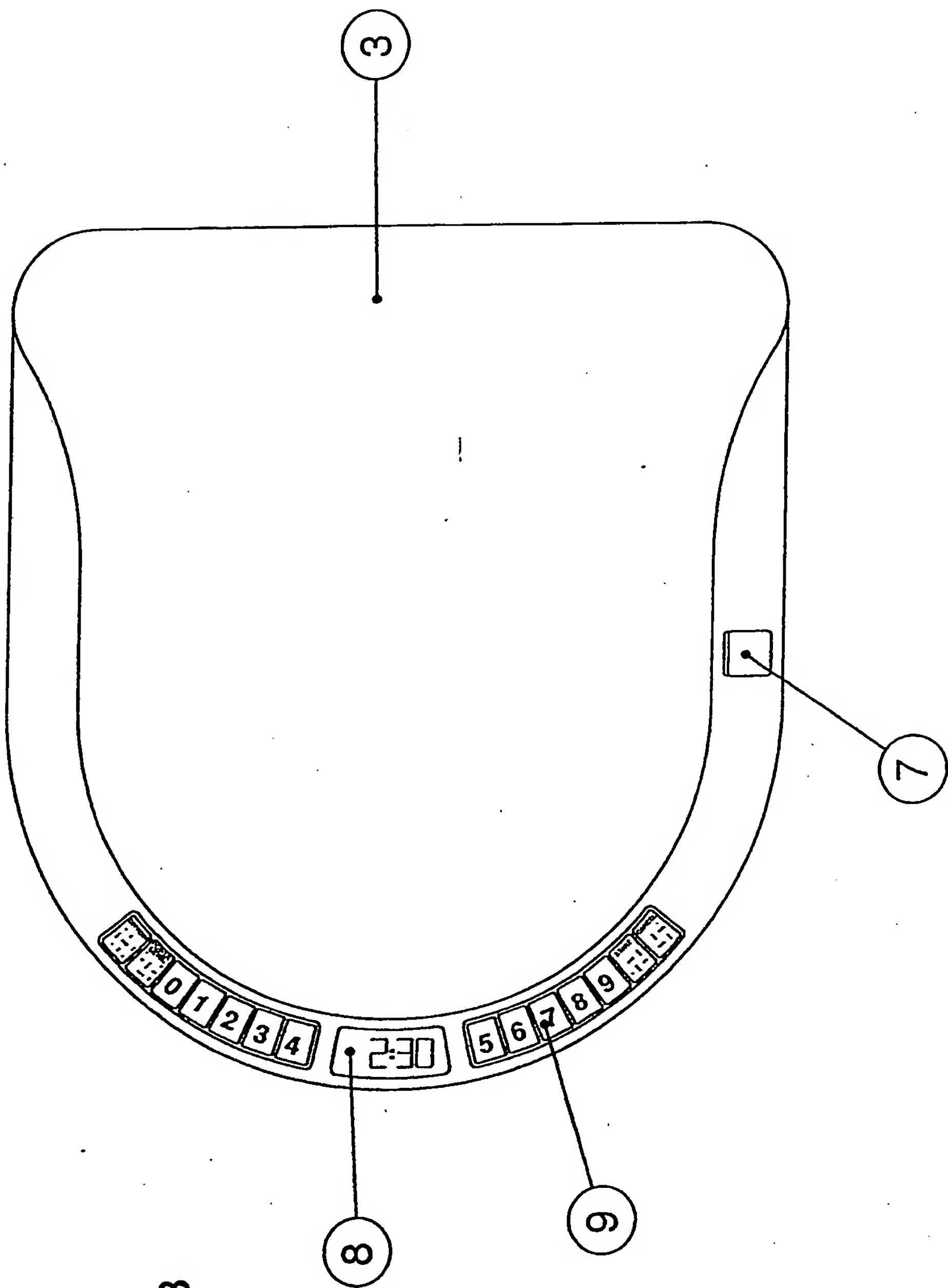
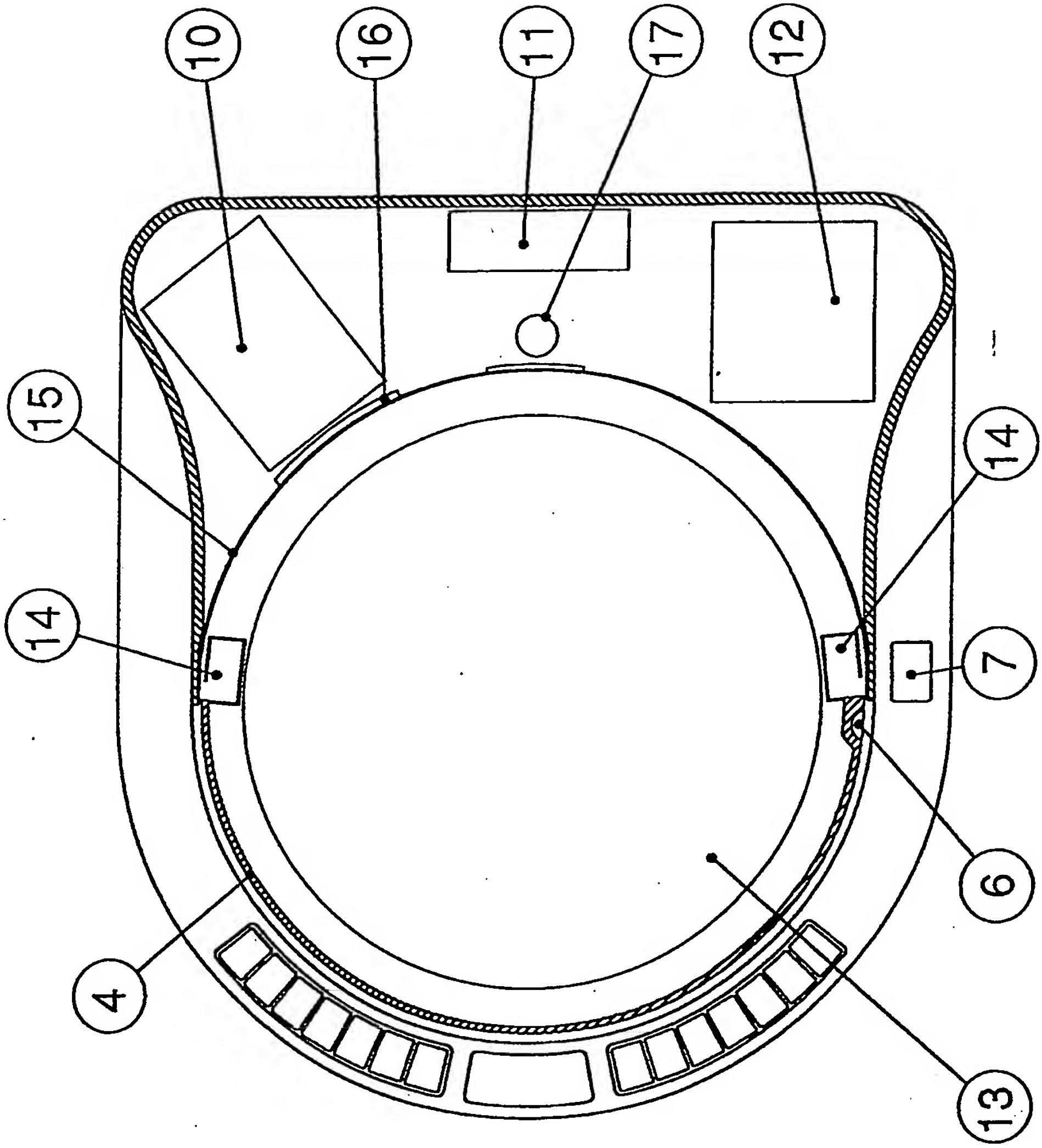


Fig 3

Fig 4



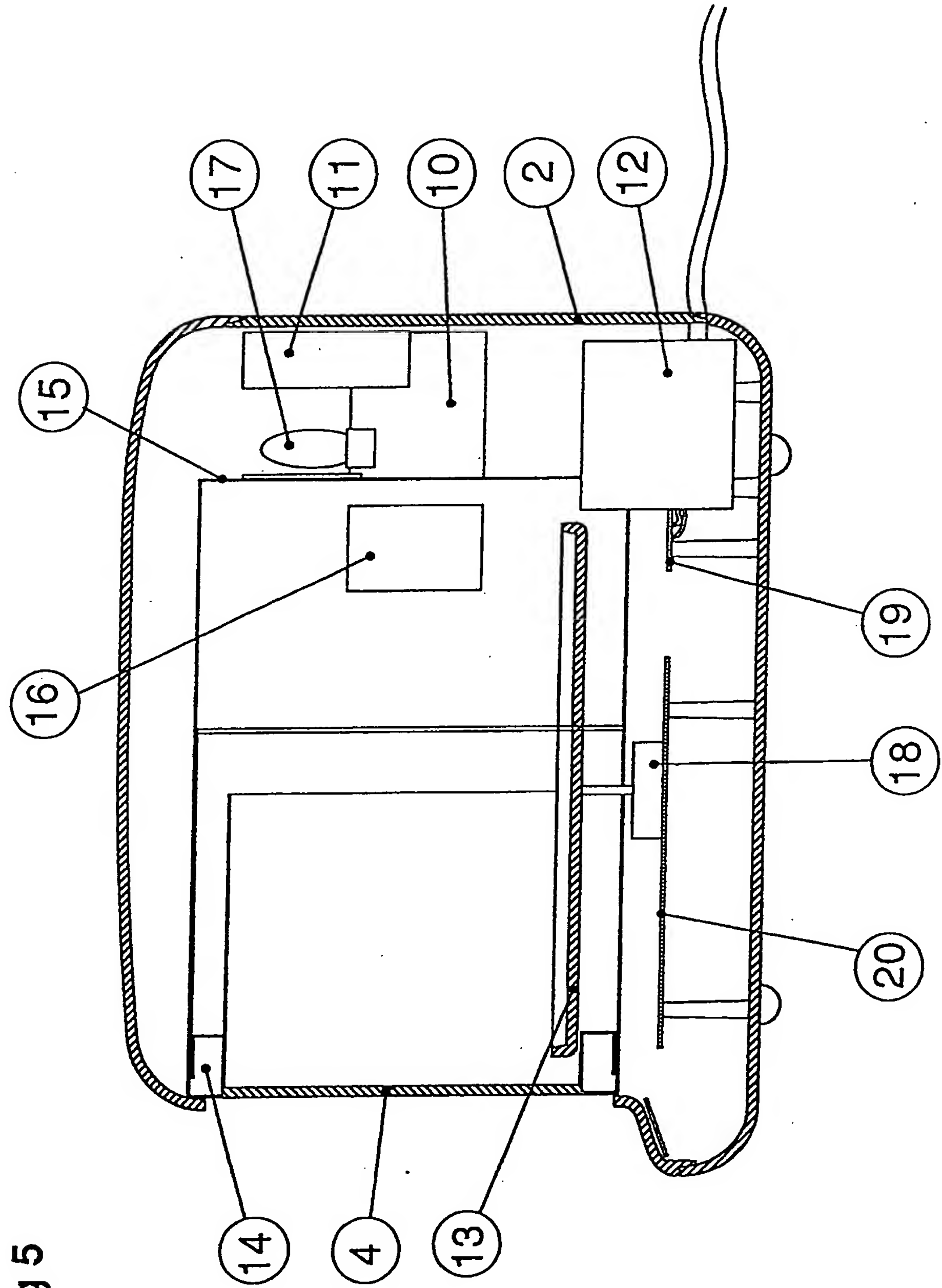


Fig 5

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MICROWAVE COOKING APPARATUS

Field of the invention

- 5     This invention relates to microwave cooking apparatus and the construction thereof.

Background to the invention

- 10    In recent years it has become increasingly popular to use microwave energy to prepare, and/or to reheat foods and drinks. A consequence of this popularity has been the development and marketing of a considerable variety of types and designs of apparatus for cooking using  
15    microwave energy, hereafter simply known as ovens.

- Many of these ovens, in particular those intended for domestic use, are configured as a self contained, free standing unit. This is most commonly, a rectangular  
20    metal box construction, with a hinged opening door on the front side giving access to the inside of an oven cavity. An alternative construction available is again a rectangular metal box construction which has the door of the oven moving slightly away from the main body of the

oven and then moving in an upward or downward direction. The movement of the door again allows access to the oven cavity.

- 5 The above arrangements are frequently inconvenient for the user, generally restricting the users access into the centre of the oven to a horizontal angle of about 90° between the horizontal lines from the center of the oven cavity and the edges of the walls defining the access  
10 aperture; and also severely restricting the choice of mounting position on a kitchen worktop, or into a built-in kitchen unit.

- The microwave ovens commonly available in commerce have a  
15 rectangular metal lined oven cavity. In use microwave energy of typically 500 to 1000 watts is launched into the cavity from a mains powered magnetron assembly mounted inside the oven unit, typically on the right hand side as the oven as viewed from the front. The oven unit  
20 also typically houses an electronic control panel and visual display, a power supply transformer and cooling fan components.

- The oven cavity is often fitted with a powered turntable  
25 and/or a mode stirrer device to provide even distribution of the microwave energy in order to ensure satisfactory cooking of the food.

- As previously described, the oven cavity is typically  
30 closed off at the front of the oven by a flat door, the door is typically hinged along one edge or may, move away from the oven and then either up or down.

The door is generally opened by the user pressing a door



release button or pulling open a door handle, this also operates a power safety interlock switch which ensures that the user of the oven is not subject to any microwave radiation above a safe level.

5

The microwave oven door is normally constructed of a clear plastic or glass window framed by a metal door pressing. Though the door may be of some visible and microwave opaque substance. Internally of the window  
10 there is a flat perforated conductive metal pressing, which allows obscured viewing through the plastic window into the metal lined oven cavity, that contains the microwave energy.

15 The metal door pressing is usually formed around the periphery of the door is of a folded box section containing internally spaced metal fingers, which act as a quarter wave choke at the frequency of the microwave energy in order to prevent microwave leakage from the  
20 oven interior to the outside.

Some microwave ovens may provide additional features, such as an electric grill or lamp for browning the food or some form of heat conductive cooking method. There  
25 are also models with temperature probes and steam sensors that provide automatic cooking control.

Because of the factors and constraints of construction outlined above the microwave ovens typically available in  
30 commerce tend to be bulky in terms of the space occupied by the unit and free space required around the unit for use. The large volume of space necessary also tends to make the ovens inconvenient in use and awkward to position.

Objects of the Present Invention

It is a main object of the invention to provide a microwave oven of greater compactness of space occupied by the oven unit and free space required around the oven unit in use. This will also increase the convenience and flexibility of location over that achievable by a microwave oven of the standard rectangular metal box construction.

10

Brief Description of the Present Invention

Thus in accordance with the first feature of the present invention, there is provided in a microwave oven comprising an oven body which includes a microwave containing oven cavity, a microwave containing door forming one wall of the oven cavity, microwave generating means of known type, and control means of known type, the improvement comprising constructing the oven cavity of substantially cylindrical form with its major axis substantially vertical, the cavity sides being defined by one or more walls fixed relative to the oven body and the door, the door being movable relative to the fixed walls between a first closed position in which the oven cavity is completely defined by the one or more fixed walls and the door, and a second open position in which the door sits substantially within the oven body whereby access may be gained to the oven cavity from outside the oven body; the door when moving between open and closed positions, moving substantially circumferentially about the major axis of the oven cavity.

30

The door is generally a single panel (or perhaps 2 oppositely sliding panels) constituting slightly more

than a half cylinder to provide a sealing overlap with the fixed metal liner, and into which the door rotates when the oven cavity is opened. Alternatively, the door may be made up of a set of interlinked slots (a so-called  
5 tambour door) running in a pair of tracks at top and bottom of the cylindrical cavity.

A major advantage of the configuration according to the present invention is that it is more convenient to get  
10 articles containing food into and out of the oven especially when using two hands because of the increased opening width.

A further advantage is that as the door slides internally  
15 into the oven body when opened, and out of the body when closed, the movement of the door between the fully open and closed positions does not affect the positioning of the microwave oven unit as the door does not sweep through any space outside the oven unit. This is  
20 especially advantageous when the oven is mounted for example in the corner of a kitchen work surface, or in a very cramped space.

The cylindrical door may be configured to include a  
25 window. The configuration of the door allows improved viewing of the oven interior from a wide angle of view.

A further advantage of the cylindrical door configuration is that it eliminates a problem of oven instability  
30 created by the vertical force of gravity experienced by an open hinged door, or any other vertical force being applied to the door.

The oven cavity may include in its base a turntable which

may be rotated to improve evenness and predictability of cooking. The turntable is most preferably configured so that the cylindrical oven cavity and turntable are generally concentric with the turntable being of a slightly smaller radius than the inner radius of the oven cavity. This has the effect that the amount of the oven cavity available for cooking on the turntable relative to the volume of the oven cavity is much larger than in currently available microwave ovens.

10

Alternative methods of construction that will help to improve the evenness and predictability of cooking of the oven are the inclusion of mode stirrers or other known techniques for the even distribution of microwaves.

15

In the most preferable embodiment the oven unit is of a semi-circular plan at the front and has a semi-rectangular plan at the rear, as generally viewed in use. The oven components, such as the microwave generating magnetron power supply and other components, are mounted in one or more of the rear corners of the unit spaced behind the cylindrical oven cavity, so providing a compact oven.

25

In order safely to contain the microwave energy, the oven cavity is configured as a continuously electrically conductive container. At any openings and meeting points between the door and the fixed half of the oven cavity a microwave choke of known type is provided to prevent leakage of microwave energy. The choke may be incorporated with or attached to the periphery of the door. Alternatively the microwave choke may be incorporated with or attached to the fixed walls of the oven cavity.

30

In addition to these features the oven of the present invention may incorporate a grilling or browning apparatus or other known microwave accessories that may be used in addition to, or instead of microwave cooking.

5

If desired the apparatus according to the invention may include electronic control and visual display means at convenient ergonomic positions on the apparatus. The particularly preferred positions for the controls are  
10 vertically adjacent to the door.

The control means may also include temperature, humidity, microwave timing and power level control using transformer and/or switched mode power supplies and other  
15 like detectors for automatic cooking control.

#### Description of Preferred Embodiment

The invention is illustrated by way of example with  
20 reference to the accompanying drawings in which:

Figure 1 shows a side elevation of a preferred form of microwave oven according to the invention with the door closed,  
25

Figure 2 shows a front elevation of the oven of Figure 1 with the door closed,

Figure 3 shows a plan view of the oven,  
30

Figure 4 shows a plan sectional view of the oven, and

Figure 5 shows a side section view of the oven with the door closed.

Referring to Figures 1, 2 and 3, these show a microwave oven according to the invention, which has a base housing 1, main housing 2, and top housing 3, a rotating sliding door 4, mounting feet 5, a door handle 6, a door release button 7, an electronic display 8, and operating controls 9.

Figure 4 is a typical plan cross section through the main housing 2 and shows a magnetron assembly 10, a cooling fan 11, a power supply transformer 12, a rotating turntable 13, a door sealing choke 14, an interior oven fixed metal liner 15, and the microwave transparent cover and launch 16.

The handle 6 is typically arranged to have a latched operation when closed and is released by the door release button 7 or the handle may be fitted with a pull catch.

The handle is provided with a limit stop in the open position. This stop can be released to allow the door to rotate completely for ease of cleaning the interior surfaces, or alternatively the door may be removed for cleaning, in which case suitable electromechanical safety interlocks are provided to prevent operating with the door removed.

Figure 5 is a typical side cross section of the apparatus and shows the oven cavity fixed metal liner 15, and the rotating sliding door 4 with the door microwave sealing choke 14, at the top and bottom edges of the door. Door 4 is configured as a clear outer electrical insulating plastic window or other visibly transparent or opaque material together with a metal sheet that is perforated with small holes in the viewing area. The perforated

sheet preventing escape of unacceptable levels of microwave radiation from the oven cavity.

5 The cooling fan 11, is typically configured to be in the rear of housing 2. Cooling air is circulated through the magnetron assembly and electronic components and also into the oven cavity to remove condensation and exhausted from the housing. An interior light 17 is typically provided with perforated venting windows in the oven  
10 metal liner.

! The turntable 13 is driven by a motor/gearbox assembly 18. A printed circuit board 19 provides termination of the mains electrical cable supply. A printed circuit  
15 board 20 provides the oven logic control and display functions.

We Claim:

1. In a microwave oven comprising an oven body which includes a microwave containing oven cavity, a microwave  
5 containing door forming one wall of the oven cavity, microwave generating means of known type, and control means of known type, the improvement comprising constructing the oven cavity of substantially cylindrical form with its major axis substantially vertical, the  
10 cavity sides being defined by one or more walls fixed relative to the oven body and the door, the door being movable relative to the fixed walls between a first closed position in which the oven cavity is completely defined by the one or more fixed walls and the door, and  
15 a second open position in which the door sits substantially within the oven body whereby access may be gained to the oven cavity from outside the oven body; the door when moving between open and closed positions, moving substantially circumferentially about the major  
20 axis of the oven cavity.

2. A microwave oven according to claim 1 in which one of the fixed walls defining the oven cavity is of substantially vertical orientation and has the  
25 configuration of a portion of the circumference of the oven cavity and is located substantially circumferentially about the major axis of the oven cavity.

3. A microwave oven according to claim 2 in which the door is of a substantially hemi-cylindrical configuration when the door is in the open position the door sits in a position substantially adjacent and parallel to the vertical fixed wall, and the angle subtended between the



horizontal lines drawn from the centre of the oven cavity to the edges of the access aperture when the door is in the fully open position is at least 110°.

- 5      4. A microwave oven according to claim 3 in which the walls defining the top and bottom of the oven cavity are substantially circular and fixed relative to the oven body and the vertical fixed wall(s).
- 10     5. A microwave oven according to claim 4 in which the door includes a substantially visible light transparent microwave opaque window.
- 15     6. A microwave oven according to claim 3 in which the walls defining the top and bottom of the oven cavity are substantially circular and are attached to the door, and mounted for rotation about the major axis of the oven cavity.
- 20     7. A microwave oven according to claim 6 in which the door includes a substantially visible light transparent microwave opaque window.
- 25     8. A microwave oven according to claim 3 in which the oven body is configured at least partially as an upright cylinder and the oven door is mounted in such part of the oven body which is configured as the oven cavity.
- 30     9. A microwave oven according to claim 8 in which the control means includes control switches and status indicators and displays located on the surface of the oven body above or below the door when in its closed position.

10. A microwave oven according to claim 8 in which the door has attached to it, or incorporated within its structure, at the edges of the door abutting the cavity a microwave choke of known type.

5

11. A microwave oven according to claim 8 in which the fixed portion of the oven cavity has attached to it, or incorporated within its structure, at the edges of the cavity abutting the door a microwave choke of known type.

10

12. A microwave oven having an oven body, a cylindrical oven cavity located within said body and having a central axis, a hemi-cylindrical door, and microwave controls and status indicators and displays mounted in the oven body adjacent the door, in which

15

the door when opened or closed moves into or out of the oven body along a path substantially circumferential to the oven cavity, rotating about an axis at least substantially coincident with the axis of the oven cavity the angle subtended by horizontal radii drawn from the major axis of the oven cavity to the sides of the aperture formed when the door is fully open being greater than  $110^\circ$ ,

20

and a plate located and centred on the base of the oven cavity, the plate being of smaller radius than the inner radius of the oven cavity, and means for rotating the plate about the said axis when the oven is in use.

25

13. A microwave oven substantially as herein described with reference to Figures 1 to 5 of the accompanying drawings.

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Patents Act 1977  
Examiner's report to the Comptroller under  
Section 17 (The Search Report)

- 13 -

Application number

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Relevant Technical fields

(i) UK Cl (Edition L) H5H (HMD)  
(ii) Int Cl (Edition 5) H05B 06/76, 06/80;  
F24C 07/02

Search Examiner

J COCKITT

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search

29 JUNE 1993

Documents considered relevant following a search in respect of claims

1-13

| Category<br>(see over) | Identity of document and relevant passages | Relevant to<br>claim(s) |
|------------------------|--|-------------------------|
| A                      | WO 90/03719 A1 (SULTING)                   |                         |
| A                      | US 4999468 A (FADEL)                       |                         |

| Category | Identity of document and relevant passages | Relevant to claim(s) |
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